Chapter 2
CALIFORNIA WATER TODAY

2.1. California – Setting.

** insert map of California with major rivers and facilities on facing page**

California is the nation's most populous state with over 36 million people. California is the top-ranked state in the value of agricultural production, contributing over half of the nation's fruit, nut, and vegetable production. Electronics, aerospace, banking, the film industry and recreation are only a few of the businesses that have made California a unique economy. The people, together with the abundant natural resources and business opportunities, have made the state's $1.4 trillion economy the fifth largest in the world. California also leads the nation in the number of native plant and animal species.

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Climate and development of a sufficient and reliable water supply are key factors in the state's success and quality of life. The state's Mediterranean climate creates ideal conditions for people to live and work, for crops to grow, and for the unique plants and animals to thrive. Precipitation varies widely from place-to-place, from season-to-season, and from year-to-year. Most precipitation and runoff occur in the northern and mountainous parts of the state and most of the people live in the southern part of the state. Interbasin storage and transfer projects allowed for redistribution of water to where it was needed for crops, people, and industry. Abundant groundwater supplies have also contributed water that has been used for beneficial purposes.

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Prior to the discovery of gold in California in 1848, California was home to about 60,000 Native Americans. These Native residents and inhabitants of several small settlements remaining from Mexican occupation of the area used relatively small amounts of water and wildlife as part of their subsistence. Habitat for fish and wildlife extended essentially unaffected by development as it had for thousands of years. Complex patterns of habitats such as conifer forests, oak woodlands, chaparral brushlands, river corridors, grasslands, wetlands, estuaries, deserts and other habitats created high species diversity and biological productivity. Periodic periods of flooding and droughts also added to the variability and diversity.

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Local water agencies have developed most of the groundwater and surface water supplies in the state. In addition, water agencies have instituted significant water conservation, water recycling, groundwater conjunctive use programs, water transfers, and other integrated operations. Nearly 600 cities and local agencies provide water through locally developed projects and imported supplies, such as the San Francisco Hetch Hetchy project from Yosemite and the Los Angeles Aqueduct from the Owens Valley. The federal and state governments developed the Central Valley Project (CVP) and the State Water

Project (SWP), respectively. While both the CVP and SWP generate water supply primarily from rivers in the northern part of the state, they deliver water to cities and farming areas in the northern, central and southern parts of the state. These projects provide other benefits such as hydropower production, flood management, and recreation.

All aspects of the California economy are dependent on water. Development over the past 150 years has made California's economy the largest in the union, but has also degraded the natural environment. During this time, the scope of threats to the environment has risen in parallel with development and the increased demands for use of rivers for transportation, water supply, recreation and energy production. Land transformation and redistribution of water has resulted in substantial habitat loss (__ acres riparian and wetlands) and declines in biodiversity of freshwater species. Water supply development has resulted in reductions in river flows, changes in timing of flows for flood management, and has contributed to species losses, impacts on commercial fisheries, and degraded water quality. At the same time, over-fishing, water pollution, and introduction of non-native species have added to the stressors affecting many native plants and animal species. The number (373) of California species listed as threatened or endangered is the highest of any state. Even with reductions in historic levels of habitat, California still provides many unique habitats. The Central Valley is the most vital waterfowl wintering area along the Pacific Flyway. Waterfowl and shorebirds forage primarily in natural and artificial wetlands and in agricultural lands. However, many valued habitats, such as the Salton Sea, Mono Lake and Lake Tahoe, are dependent on continued human intervention to ensure those habitats are maintained.

In recent decades, the reliance on historic water management methods (storage and conveyance) has adapted to include more water conservation and recycling and other water management strategies. Water planners are now considering broader stakeholder needs in developing more inclusive, innovative and diversified plans.

2.2. Existing statewide water uses and supplies.

California has resources to meet many, but not all, of its water demands in most years with its present population. Rural residents on small water systems or wells can experience limited water supply during droughts. Except in multiyear droughts, many urban areas have sufficient supplies for existing populations. However, even in average years some agricultural demands are not fully met. The past few decades have seen more water being dedicated for environmental needs, but on many rivers/streams, flows have been modified to the extent that they no longer support ecosystem functions; flow regimes no longer resemble natural hydrographs. Water quality is generally good but many areas face specific water quality problems.

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This update of the California Water Plan presents a range of actual water supply conditions that have occurred in recent water years. Water year 1998 represents a recent wet year in California, year 2000 is a representative normal water year, and year 2001 provides a snapshot of a drier water year. The following table provides a broad summary water balance for the state for these years. Similar summary tables are presented in Chapter 4 for each hydrologic region and detailed water balances, water portfolios, and flow diagrams for each region can be found in Volume 2. The advantage of these new water portfolio tables and flow diagrams is that they provide an accounting of water that enters and leaves the state, which is an important tool for all water planning activities. However one shortcoming of this expanded process is that there are many regions of the state where some of the water portfolio categories have never been measured or quantified. Thus, the resulting water portfolios show many gaps where inadequate data are available. However, the ability to identify where additional data collection activities are needed is an important byproduct of this process.

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Another inadequacy is that there is no example of the sequences of dry years which are the most serious problem. These portfolios are a snapshot of the conditions that existed at one point in time. There is little likelihood that the conditions will ever be repeated, so these portfolios cannot be used for planning future water management activities. However, a series of perhaps 10 or more actual years of data would be very helpful for developing representative conditions for both average and sustained drought conditions.

STATE OF CALIFORNIA
STATEWIDE WATER BALANCE SUMMARY - MAF

Water Entering the State – Water Leaving the State = Storage Changes in State

(See Volume 2 for Details)	1998 (wet)	2000 (average)	2001 (dry)
Water Entering the State			
Precipitation	329.6	187.7	139.2
Inflow from Oregon/Mexico	2.2	1.7	1.2
Inflow from Colorado River	5.0	5.3	5.2
Imports from Other Regions	N/A	N/A	N/A
Total	**336.8**	**194.7**	**145.6**
Water Leaving the State			
Consumptive Use of Applied Water * (Ag, M&I, Wetlands)	19.7	24.6	25.2
Outflow to Oregon/Nevada/Mexico	1.5	0.9	0.7
Exports to Other Regions	N/A	N/A	N/A
Statutory Required Outflow to Salt Sink	61.4	38.6	21.8
Additional Outflow to Salt Sink	39.8	17.7	9.1
Evaporation, Evapotranspiration of Native Vegetation, Groundwater Subsurface Outflows, Natural and Incidental Runoff, Ag Effective Precipitation & Other Outflows	209.0	118.6	103.2
Total	**331.4**	**200.4**	**160.0**
Storage Changes in State [+] Water added to storage [–] Water removed from storage			
Change in Surface Reservoir Storage	7.1	-1.4	-4.6
Change in Groundwater Storage **	-1.7	-4.3	-9.8
Total	**5.4**	**-5.7**	**-14.4**

Applied Water * (compare with Consumptive Use) * Definition - Consumptive use is the amount of applied water used and no longer available as a source of supply. Applied water is greater than consumptive use because it includes consumptive use, reuse, and outflows.	33.8	41.0	41.2

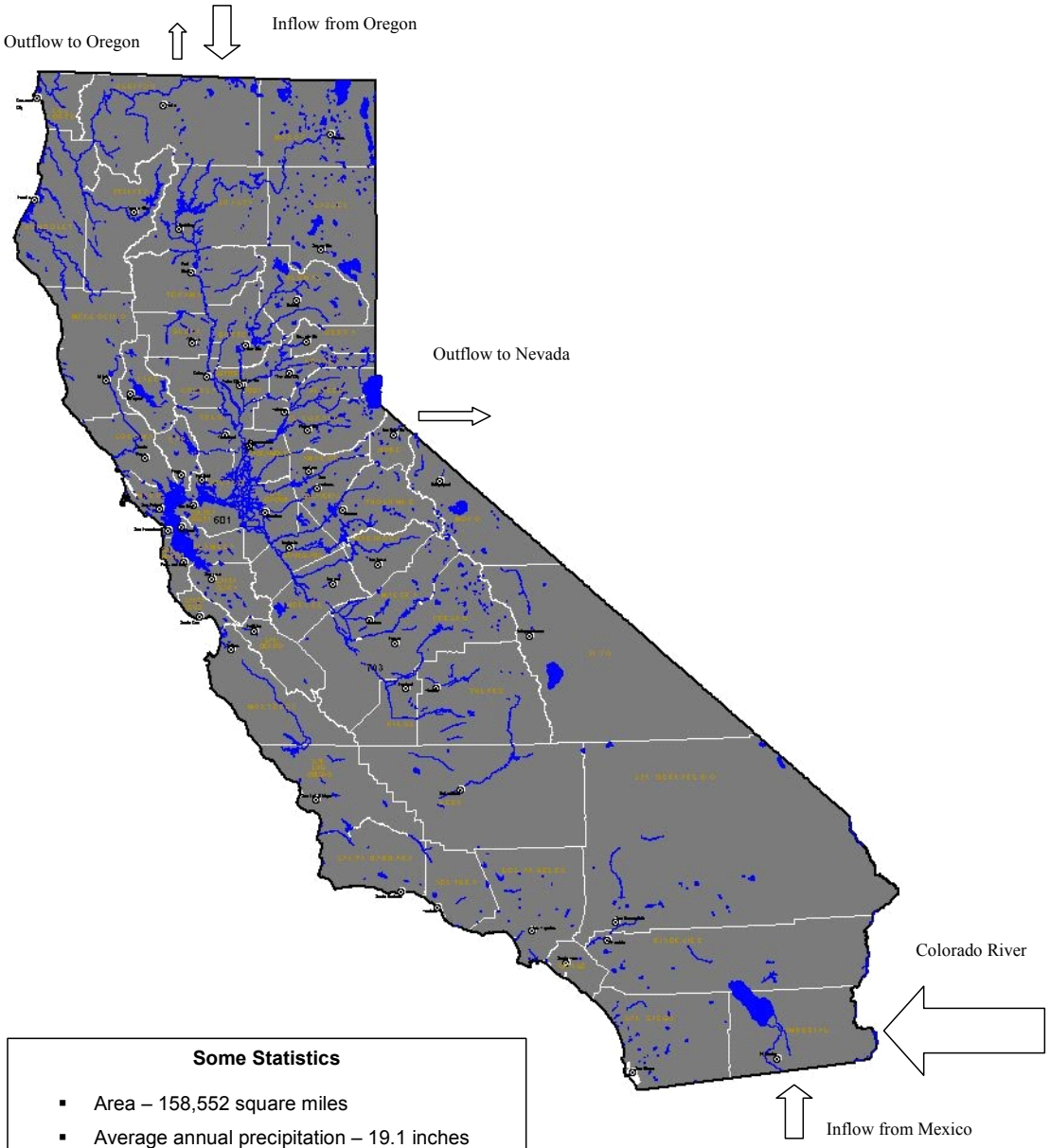
****Footnote for change in Groundwater Storage**

Change in Groundwater Storage is based upon best available information. Basins in the north part of the State (North Coast, San Francisco, Sacramento River and North Lahontan Regions and parts of Central Coast and San Joaquin River Regions) have been modeled – spring 1997 to spring 1998 for the 1998 water year and spring 1999 to spring 2000 for the 2000 water year. All other regions and year 2001 were calculated using the following equation:

GW change in storage =
intentional recharge + deep percolation of applied water + conveyance deep percolation - withdrawals

This equation does not include the unknown factors such as natural recharge and subsurface inflow and outflow.

STATE OF CALIFORNIA



Some Statistics

- Area – 158,552 square miles
- Average annual precipitation – 19.1 inches
- Year 2000 population – 34,075,700
- 2030 projected population – 52,289,900
- Total reservoir storage capacity – 40,741 TAF
- 2000 irrigated agriculture - 8,976,310 acres

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When discussing water supplies and their uses, we must keep in mind that not all water is the same; water quality is inherently linked to water supply and use. Various water management actions, such as transfers, water use efficiency, water recycling, conjunctive use of aquifers, storage and conveyance, Delta operations, land fallowing, and hydropower all potentially have water quality impacts. Groundwater overdraft in coastal aquifers can result in seawater intrusion, thereby increasing the salinity of groundwater. Alternatively, degraded water quality can limit, or make very expensive, some water supply uses or options because the water must be treated before use. Furthermore, water managers are increasingly recognizing that the water quality of various water supplies needs to be matched with its eventual use and its potential treatment.

2.3. Roles in water management.

California has a very large and complex water system, with a highly decentralized system of governance involving state and federal agencies, thousands of local governments, private firms, and millions of households and farms making important water management decisions and contributing funding to the system. This decentralization has a major influence on daily management, planning, and policy making. Competing and conflicting roles and responsibilities make it difficult to integrate regional water management. Differing roles of the various state and federal governments during planning can also create coordination difficulties.

State government. The state Water Resources Control Board (SWRCB) integrates water rights and water quality decision-making authority. The SWRCB, together with the nine Regional Water Quality Control Boards (RWQCB), are responsible for protecting California's water resources. Pursuant to the Porter-Cologne Water Quality Control Act, water quality control plans for each of the nine regions shall become part of the California Water Plan.

State Government Agencies Ro… Water Management

- State Water Resources Control Board – Re… California's water rights and water quality
- Regional Water Quality Control Boards – P… ground and coastal water quality
- Department of Water Resources – Operate… Water Project and is responsible for overall…
- Department of Health Services – Oversees… Oversees programs to protect and improve… Californians– Regulate and permit drinking…
- Department of Fish and Game – Regulates and conserves the state's wildlife
- Reclamation Board – Plans and controls flooding along the Sacramento and San Joaquin Rivers and their tributaries in cooperation with the U.S. Army Corps of Engineers
- Department of Food and Agriculture – Supports California's agricultural economy
- California Environmental Protection Agency – Restores, protects and enhances the environment, to ensure public health, environmental quality and economic vitality
- Delta Protection Commission – Responsible for preparation of a regional plan for the "heart" of the Delta
- Colorado River Board - Protects California's rights and interests in the resources provided by the Colorado River
- California Bay-Delta Authority – Develops and implements a long-term comprehensive plan to restore ecological health and improve water management for beneficial uses of the in the Bay-Delta
- Department of Pesticide Regulation
- Department of Toxic Substances Control
- California Integrated Waste Management Board

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The Department of Water Resources (DWR) operates the State Water Project and is responsible for overall water planning for the state. The Department of Fish and Game, the Department of Health Services (DHS), California EPA, Department of Food and Agriculture, and others play important roles in the regulation and management of California's water resources.

Federal government. The Bureau of Reclamation operates the Central Valley Project, the largest water project in California. The USEPA, Fish and Wildlife Service and others play important roles in the regulation and management of California's water resources.

The state and federal governments are responsible to represent and protect the public trust (certain types of property of high public value held for the benefit of all citizens). Together, the state and federal governments provide assistance and guidance to local governments (city and county owned municipal water systems, etc.), Native American Tribes, and special districts.

Federal Government Agencies Roles in Water Management

- Bureau of Reclamation – Federal water supply projects, Secretary of Interior is watermaster on Colorado River
- USEPA – Protecting human health, safeguarding the natural environment
- Fish and Wildlife Service – conserve, protect and enhance fish, wildlife, and plants and their habitats
- U.S. Geological Survey – Water measurement and water quality research, biological surveys
- NOAA Fisheries – Protects and preserves living marine resources, including anadromous fish
- Bureau of Land Management – Manages federal lands
- National Park Service – Manages national parks, including their watersheds
- Department of Agriculture – Manages forests, watersheds, and other natural resources
- U.S. Army Corps of Engineers – Flood management and wetlands permits
- Western Area Power Administration – Manage

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Native American Tribes. American Indian tribes exist under a unique relationship with the federal government as that of a beneficiary and trustee, respectively. In a broad sense, the federal government has a fiduciary responsibility to Indian tribes; however, the execution and effectiveness of this responsibility differs between the three branches of the federal government.

When reservation lands were set aside, the natural resources of the reservations also were reserved for tribal people. The federal government is legal titleholder to all trust resources. Native American Tribes operate in their government to government relationship with federal agencies and help plan water resource projects affecting tribal land. For some tribes, their natural resources rights had little value for many years. Once needs were identified for agricultural or other development, the assertion of their rights often led tribes to the judicial system. Several landmark decisions have defined legal principles for intergovernmental relationships and tribal rights. In California, and elsewhere, tribes without federal recognition do not enjoy governmental status or benefits. Tribal water rights are discussed in a following section.

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Reversing a long trend of administrative and economic failures in the administration of the government's trust relationship with tribes, in 1970 President Richard Nixon issued a statement in support of strengthening Indian tribal governments and improving the trust relationship. This established a turnaround

of federal policies of the past that impacts federal actions today. Since 1970, the federal government has initiated programs to encourage development of Indian resources and tribal self-determination.

Public agencies, districts and local governments. Local city and county governments and about 3,500 special districts have ultimate responsibility for providing safe and reliable water to their customers. In general, there are two methods in California for forming special districts which develop, control, or distribute water: enactment of a general act under which the districts may be formed as set forth in the act, and enactment of a special act creating the district and prescribing its powers. Cities and counties are the land management and planning entities as well as resource management agencies, which most influence the location and amount of population growth within the state. Many counties have adopted ordinances that require permits for certain uses of groundwater within their boundaries.

Private entities. In addition to public agencies, there are private entities that may provide water supply. Mutual water companies, for example, are private corporations that perform water supply and distribution functions similar to public water districts. Investor-owned utilities are also involved in water supply activities, sometimes as an adjunct of hydroelectric power development. These investor-owned water companies are regulated by the State Public Utilities Commission.

Individual water users. Collectively, the millions of urban businesses, individual households, and farms fund the operation and maintenance of California's water systems through payment of their taxes and water bills. Each makes decisions on water use and conservation for their own circumstances. After each water use, individual water users must dispose of their used water, usually through a sewer or gutter, which in turn can create water pollution. During drought periods, many households modify outdoor watering to conserve water. Each year, farmers make decisions on planting and water application based on weather conditions, forecasted water supply, and individual tolerance for market risk. Taken together, these individual decisions about water use have an enormous impact on both water demand and water quality and present many opportunities for individuals to play positive roles in better managing California's water quantity and quality.

Regional groups. While each of the above entities have individual roles in water management, they can be even more effective working together in regional groups to improve water management. See Chapter 4 for more information on regional planning.

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Native American Tribes operate with the federal government and help plan water resource projects affecting tribal land.¶

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2.4. Understanding how water is allocated, used and regulated in California.

In California, water use and supplies are controlled and managed under an intricate system of common-law principles, constitutional provisions, state and federal statutes, court decisions, and contracts or agreements. All of these components constitute the institutional framework for the protection of public interests and their balance with private claims in California's water allocation and management.

Constitutional, statutory and common-law framework for water Uses.

The people of California own all the water in the state. Water rights provide the right to reasonable and beneficial use of the water, not ownership of the water.

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California's water law and policy, Article X, Section 2 of the California Constitution, requires that all uses of the state's water be both reasonable and beneficial. It places a significant limitation on water rights by prohibiting the waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of water.

Public Trust Doctrine. The Public Trust Doctrine is a common-law doctrine, with roots in Roman law, that embodies the principle that the state holds title to tidelands and the beds of navigable lakes and streams within its borders in trust for the benefit of the public. Traditional public trust rights included navigation, commerce and fishing. However, in recent years the courts have construed public trust uses to include recreation, protection of fish and wildlife, preserving trust lands in their natural condition for scientific study and scenic enjoyment, and related open-space uses. In National Audubon Society v. Superior Court of Alpine County, the California Supreme Court concluded that the public trust is an affirmation of the duty of the state to protect the people's common heritage of streams, lakes, marshlands and tidelands, surrendering such protection only in rare cases when the abandonment of that right is consistent with the purposes of the trust. Thus, California agencies have fiduciary obligations to the public when they make decisions affecting trust assets.

In National Audubon, the court addressed the relationship between the Public Trust Doctrine and California's water rights system, and integrated them. The Court reached three major conclusions:

1. The state retains continuing supervisory control over its navigable waters and the lands beneath them. This prevents any party from acquiring a vested right to appropriate water in a manner harmful to the uses protected by the public trust. The State Water Resources Control Board

may reconsider past water allocation decisions in light of current knowledge and current needs.

2. As a practical matter, it will be necessary for the state to grant usufructuary licenses to allow appropriation of water for uses outside the stream, even though this taking may unavoidably harm the trust uses of the source stream.

3. "The state has an affirmative duty to take the public trust into account in the planning and allocation of water resources, and to protect public trust uses whenever feasible."

Thus, while the state may, as a matter of practical necessity, have to approve appropriations which will cause harm to trust uses, it "must at all times bear in mind its duty as trustee to consider the effect of such taking on the public trust, (cite omitted) and to preserve, so far as consistent with the public interest, the uses protected by the trust."

Surface water rights. California's system for surface water rights recognizes both riparian rights and appropriative rights. Riparian rights were adopted in California as a part of the English Common Law when California became a state in 1850. At that time, gold miners were already operating under their own system that recognized claims to water rights based on prior appropriation.

- **Riparian.** A riparian right is the right to divert, but not store, a portion of the natural flow for use based on the ownership of property adjacent to a natural watercourse. Water claimed through a riparian right must be used on the riparian parcel. Such a right is generally attached to the riparian parcel of land except where a riparian right has been preserved for non-contiguous parcels when land is subdivided. Generally, riparian rights are not lost through non-use. All riparian water users have the same priority; senior and junior riparian water rights do not exist. During times of water shortage, all riparian water users must adjust their water use to allow equal sharing of the available water supply.

- **Appropriative.** Under the prior appropriation doctrine, a person may acquire a right to divert, store, and use water regardless of whether the land on which it is used is adjacent to a stream or within its watershed. When water in a stream is over appropriated, a priority system determines which appropriators may divert water. The rule of priority between appropriators is "first in time is first in right." A senior appropriative water rights holder may not change an established use of the water to the detriment of a junior, including a junior's reliance on a senior's return flow. Acquisition of appropriative water rights is subject to the issuance of a permit by the State Water Resources Control Board (SWRCB) with priority based on the date a permit is issued. Permit and license provisions do

not apply to pre-1914 appropriative rights (those initiated before the Water Commission Act took effect in 1914), but pre-1914 rights are still subject to reasonable and beneficial use. Appropriative rights may be sold or transferred.

Groundwater use and management. California does not regulate the extraction and appropriation of groundwater. With the exception of the 19 adjudicated groundwater basins and basins in which a local agency has obtained statutory authority to manage groundwater, any overlying landowner in California has the right to build a well and extract groundwater as long as that groundwater is put to a reasonable and beneficial use. In 1903, the California Supreme Court rejected the English Common Law system of absolute ownership of groundwater, which allowed for unregulated pumping of groundwater. Instead, the court adopted the rule of "reasonable use of percolating waters." This established the doctrine of "correlative rights and reasonable use" under which every landowner in the basin has a right to extract and use groundwater and that right is correlative with the rights of all the overlying landowners in the basin. Those correlative rights are not quantified until the basin is adjudicated. An overlying landowner's right is considered to be analogous to a riparian right to surface water. Groundwater can be appropriated-use on non-overlying lands if water is surplus to the reasonable needs of overlying owners. The Baldwin v. Tehama decision affirmed the authority of counties to regulate ground water resources within their boundaries. Many local agencies and governments have prepared groundwater basin management plans under AB 3030.

Tribal water rights. Some Indian reservations and other federal lands have reserved water rights implied from acts of the federal government, rather than state law. When tribal lands were reserved, their natural resources were implicitly reserved for tribal use. Since reserved tribal rights were generally not created by state law, states' water allocations did not account for tribal resources. In the landmark Winters v. U.S. case, in 1908 the U.S. Supreme court established that sufficient water was reserved to fulfill the uses of a reservation at the time the reservation was established. The decision, however, did not indicate a method for quantifying tribal water rights. Winters rights also retain their validity and seniority over state appropriated water whether or not the tribes have put the water to beneficial use. Only after many years did tribes begin to assert and develop their reserved water rights. In 1963 the U.S. Supreme Court decision Arizona v. California reaffirmed *Winters* and established a quantification standard based on irrigation, presupposing that tribes would pursue agriculture. Despite criticisms of the "practicably irrigable acreage" (PIA) quantification standard from various perspectives, the PIA standard provided certainty to future water development. Quantifying water needs in terms of agricultural potential does not accurately show the many other needs for water. Even urban water quantity and quality assessments that look at the adequacy of the domestic water supply and sanitation do not provide a complete picture of tribal water needs. A

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large part of the tribal water needs are for instream flows and other water bodies that support environmental and cultural needs for fishing, hunting, and trapping.

The 1902 Reclamation Act provided for the establishment of irrigated agriculture and settlement throughout the Western states. Historical perspective indicates this policy was pursued generally without regard to Indian water rights or the 1908 Winters decision. In 1952, Congress passed the McCarran Amendment which waived sovereign immunity and authorized the adjudication of federal water rights in stream adjudications brought in state courts . The court later ruled that state adjudications may also apply to Indian reserved water rights held in trust by the United States. In asserting their Winters rights, tribes have come into conflict with water-using development that grew out of substantial federal and private investment. Costly litigation, negotiation, or both are the usual means of resolving Indian water disputes, and some cases can take decades to reach agreement. Some tribes request assistance from the federal government to pursue their water rights settlements, reminding concerned parties of the conflicting roles the federal government can assume on two or more sides of a judicial or administrative issue.

The law of the river. The Colorado River is managed and operated under numerous compacts, federal laws, court decisions and decrees, contracts, and regulatory guidelines collectively known as the "Law of the River." In 1922, the seven Colorado River basin states negotiated the Colorado River Compact, which divided the states into two basins—upper and lower—and apportioned 7.5 million acre-feet per year to each basin. The compact also referenced Mexico's right to the Colorado. The Boulder Canyon Project Act of 1928 ratified the Compact and established California's apportionment at 4.4 million acre-feet per year. In 1944, the United States signed a water treaty in which it agreed to deliver an annual quantity of 1.5 million acre-feet of water annually to Mexico.

While compact negotiators estimated the flow of the river to be at least 17 million acre-feet per year, today's records indicate a flow of 15 million at Lee Ferry, just below Lake Powell. Consequently, the sum of the actual compact apportionments and the Mexican treaty exceed the flow of the river in most years.

Water contracts. Water contracts are a way for an entity to obtain short-term or long-term access to water without having specific water rights to the water. State, federal, and many local water agencies have written contracts for delivery of water to other water purveyors or customers. Both the SWP and CVP have water rights that are subject to area of origin protections (see following section). The Operating Criteria and Plan (OCAP) provides detailed analysis of proposed CVP and SWP operations (see http://www.usbr.gov/mp/cvo/ocap.html). Both projects have written contracts to deliver water to water agencies that repay capital and operating costs. During some years, water deliveries are lower than

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the contract amounts shown below. (See the water portfolios for each region in Volume 2).

- **State Water Project** - DWR has long-term water supply contracts for water service from the State Water Project with 29 local agencies for about 4.2 million acre-feet annually. The majority of the SWP goes to urban uses.

- **Central Valley Project** – The CVP supplies water to more than 250 long-term water contractors extending from Shasta County in the north to Kern County in the south. Collectively, the contracts call for a maximum annual delivery of 9.3 MAF; 4.8 MAF is classified as project water and 4.5 MAF is classified as water right settlement water.

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International Trade Agreements

Since January 2000, more than 140 World Trade Organization member governments have been negotiating to further liberalize the global services market. The General Agreement on Trade in Services (GATS) is among the WTO's most important agreements. It is a set of multilateral rules covering international trade in services. The GATS specifically recognizes "the right of Members to regulate, and to introduce new regulations, on the supply of services … in order to meet national policy objectives".

No international trade treaty now in effect or being negotiated by the United States would prevent local, state, or federal government agencies from reviewing and regulating water projects that involve private companies with multinational ties. Such projects include desalination plants, water transfers, water storage projects (both above- and below-ground), and waste water reclamation projects. So long as government regulations are applied in the same manner to water projects involving multinational corporations as they are to water projects owned or operated by domestic companies or public utilities, there would be no conflict with international trade treaties. See the Reference Guide (Volume 3) for

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Some regulations governing water related resources management

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Regulations protecting water quality - Water quality is an important aspect of water resource management.

- Clean Water Act-National Pollutant Discharge Elimination System
- Porter-Cologne Water Quality Control Act
- Safe Drinking Water Act
- California Safe Drinking Water Act

Environmental laws and regulations - Several laws outline the state and federal obligations to protect and restore degraded habitats and species.

- Federal Endangered Species Act
- California Endangered Species Act
- Natural Community Conservation Planning
- Clean Water Act and River and Harbors Act (Dredge and Fill Permits)
- Water Code (Public Interest Terms and Conditions, etc.)
- Fish and Game Code (Streambed Alteration Agreements, Releases of Water for Fish, etc.)
- Migratory Bird Treaty Act
- Fish and Wildlife Coordination Act
- Central Valley Project Improvement Act
- State and Federal Wild and Scenic Rivers System
- National Wilderness Act

Regulating project planning, Implementation and mitigation - Another set of environmental statutes compels governmental agencies and private individuals to document and consider the environmental consequences of their actions.

- National Environmental Policy Act
- California Environmental Quality Act

Regulations for water use efficiency - Water Code Section 275 directs the Department and SWRCB to "take all appropriate proceedings or actions before executive, legislative, or judicial agencies to prevent waste or unreasonable use of water."

- Urban Water Management Planning Act
- Water Conservation in Landscaping Act
- Agricultural Water Management Planning Act
- Agricultural Water Suppliers Efficient Management Practices Act
- Agricultural Water Conservation and Management Act (AB3616) of 1992
- Water Recycling Act of 1991
- CALFED Water Use Efficiency Program

Local land use – Water planning is influenced by local land use requirements.

- Local General Plans and Specific Plans
- SB 221
- SB 610

Other regulations – Some other regulations that influence water resource management include:

- Federal Power Act
- Cloud Seeding Regulations
- State Water Resources Control Board decisions

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Releases of water for environmental uses. Fish and Game Code Section 5937 provides protection to fisheries by requiring that the owner of any dam allow sufficient water to pass downstream to keep in good condition any fisheries that may be planted or exist below the dam. See the adjoining page for other regulations. See the adjoining page for other environmental regulations.

Water transfers. Every year, hundreds of water transfers (totaling hundreds of thousands of acre-feet) take place between water users for a wide variety of reasons. Some provide moving water on a short-term basis for drought-year emergency water supplies and some provide for long-term water supplies. Water transfers occur within districts and projects, and occur between regions. The state has facilitated transfers by purchasing and selling water through the Drought Water Bank. Short-term water transfers also include SWP supplemental water purchases and CVPIA and EWA water acquisitions. See the Water Transfer narrative in Chapter 5 for more detail.

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Area of origin protections. During the years when California's two largest water projects, the CVP and SWP, were being planned and developed, area of origin provisions were added to the water code to protect local Northern California supplies from being depleted by the projects. County of origin statutes reserve water supplies for counties in which the water originates. The Delta Protection Act, enacted in 1959 (not to be confused with the Delta Protection Act of 1992), requires the SWP and the CVP to provide salinity control in the Delta and an adequate water supply for water users in the Delta. In 1984, additional area of origin protections were enacted to prohibit the export of groundwater from the combined Sacramento River and Delta Basins, unless the export is in compliance with local groundwater plans.

Institutional tools for managing resources

In many cases, several institutional tools interact in managing resources.

- **Collaborative decision-making –** Often, a decision made through collaboration can avoid the need for new legislation, regulation, and litigation.

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- **Education –** Educational programs are often the least expensive way to influence public action. Information on water use efficiency practices, water costs, habitat conditions and other important subjects can help the public become active participants in plan implementation.

- **Legislation –** Legislation can provide new statutes for managing resources.

In December 2000, Assembly speaker Robert Hertzberg convened a statewide Speaker's Commission on Regionalism.

Its mission is to "*develop innovative state government policies and strategies that will encourage and support regional collaboration among local governments' and to encourage regional collaboration among local governments and civic, business, and other community organizations, to better enable our governments and our citizens to address California's major economic, social, and environmental challenges in the years ahead.*"

- **Voter-approved propositions –**Voters can directly enact new laws by approving propositions. In many cases, voters decide on major funding requests. Since 1996, voters have approved four major California water bonds (204, 13, 40, and 50).

- **Regulation –** A regulation is a rule adopted by a state regulatory agency to implement, interpret, or make specific the law enforced or administered by it, or to govern its procedure.

- **Litigation –** Lawsuits provide a dispute-resolution tool that most, if not all, water stakeholders will employ when it appears to be their best alternative. These judicial proceedings can provide greater certainty to water rights holders and to public trust values in California in ways that the collaborative process may fail to accomplish. Legal precedents create a framework for setting up water resource management programs, but do not themselves create or implement the programs.

Water reliability management

Most water agencies strive to meet customer's demands for water all the time, but may be able to deliver only a portion of that water during dry periods. Customer surveys often demonstrate the importance of reliable water systems, including the willingness to pay for higher reliability.

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Water reliability management involves decisions on how a water agency and its customers will get though the dry periods. It is usually an economic decision whether to augment the supply to make it more reliable during a drought or to take measures to reduce water demand during a drought. Groundwater can provide a completely reliable supply in the short-term, but if the amount of groundwater used continues to exceed the amount that is recharged over the long-term, unacceptable consequences caused by overdraft may occur. Urban Water Management Plans and drought contingency plans are examples of how agencies plan for the reliability of their systems.

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Today, there are tools and techniques available to rigorously analyze the costs of taking actions to maintain or increase reliability and comparing those with the costs of accepting less reliability. On this basis, accepting the costs of less than total reliability could be a legitimate planning decision. Acceptable levels of reliability will differ for residential, industrial and agricultural water users and will vary from one geographic area (region) to another.

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The questions for California water agencies include: (1) what reliability level does existing and foreseeable resources provide in light of projected water demands within the planning horizon?; (2) is the anticipated reliability level acceptable

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compared to the cost of unreliability?; (3) what are the water demand reduction and supply augmentation measures available and their costs to either maintain existing or enhance reliability?; and (4) is it cost-effective to maintain or enhance reliability? As implementation of other strategies becomes more costly, foregoing reliability at times may become more reasonable as a planning decision.

2.5. Challenges facing California water resources and management.

Experience with past droughts, most notably in 1976 -1977 and 1987-1992, demonstrated the economic and environmental impacts of critical water shortages throughout California. There is always a threat of longer and more severe droughts.

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Until the mid-1900s, construction of new water supply infrastructure was the primary method of securing water for a wide variety of water uses. Today's challenges facing California water resources and management still revolve around how to deal with the need to balance the limited, and variable, water supplies for various uses, especially during droughts.

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Some of the specific challenges that will require improved water management include the following.

Population growth

California's population has increased by about 6 million people since the 1987-1992 drought ended. California's year 2002 population of over 36 million is expected to swell by an additional 17 million people to 53 million by year 2030. Providing this growing population with a sufficient, affordable, safe and reliable water supply is a major challenge facing water managers, especially in light of other challenges that tend to diminish water supply. With current water use rates, average year water demand in urban areas would increase from about 8.8 MAF annually to 11.4 MAF annually by 2020. At the same time, this population growth creates competition with existing agricultural and open space land uses and can profoundly influence water quality.

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Less water from the Colorado River

California's use of the Colorado River has historically exceeded the 4.4 maf/year apportioned to it by the "law of the river" since it has been able to divert and use Arizona's and Nevada's unused apportionments, and to divert surplus water. During some years, California has used up to 5.3 maf from the Colorado River. Now, because of increasing needs of other states, California must implement a plan to reduce use of Colorado River water to 4.4 maf/year.

Contamination of surface and groundwater is limiting supplies

Meeting existing drinking water standards continues to be a challenge for water managers due to continually changing source water flows and quality. The trend has been for the standards to become more stringent over time to protect health and safety as new health risk information is obtained. Increases in population result in higher wastewater flows and many wastewater treatment plants discharge into surface waters that are the drinking-water sources for downstream communities. A wide variety of toxic substances are washed off urban areas in storm water runoff. Industrial discharges can contribute a wide variety of contaminants. A portion of irrigation water, not directly needed by crops, percolates into the soil and is drained away from the root zone naturally or in constructed facilities. This drainage water, which picks up salts and other contaminants from the soil, can create water quality problems for the receiving surface or groundwater. Agricultural drainage and urban runoff are two of the largest contributors of human-induced contamination of surface and groundwater in California.

Global Climate change

California's water systems have been designed and operated based on data from a relatively short hydrologic record. Some scientific studies suggest that forecasted climate changes could significantly change California's precipitation pattern and amount that shown by the record. Less snow pack would mean less natural water storage. More variability in rainfall, wetter at times and drier at times, would place more stress on the reliability of existing flood management and water systems. The high dependence on reservoir storage and snow pack for water supply and flood management make California particularly vulnerable to these types of projected hydrologic changes and make a strong case for increased usage and better management of our aquifer systems.

Reliability of irrigation water for food production

Providing food and fiber crop products for each California family, as well as families in other states and countries, consumes more water than is needed for all their other household needs. Each family is the true end user for all water used to run their households and to produce the food and fiber that they consume. As population increases, the need for food and fiber crops also will increase. The last 20 years have produced a continuing reallocation of water from the production of food and fiber to environmental and urban uses. In addition, continued groundwater overdraft in some areas further reduces available water supply for agriculture and other uses. The cumulative effects of the overdraft and these reallocations threaten the reliability of irrigation water for food production. Agriculture cannot easily rebound in years of adequate water supply if its water supplies are greatly curtailed during dry years. Some agricultural areas do not have usable sources of affordable groundwater to tap

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during water shortages. Growers of permanent crops are particularly at risk. Even growers of annual crops may be unable to obtain long-term loans or short-term credit if they do not have access to a reliable water supply.

Degradation of the ecosystem

The major issues facing California's ecosystems are aquatic and riparian habitat degradation and freshwater biodiversity declines throughout the state that are directly linked to physical alterations associated with on-stream dams, diversions, levees and bank armoring; deterioration of water quality including temperature, pollution, and low dissolved oxygen; the introduction of non-native invasive species; and long-term changes in the weather. Over the past century, the scope of these threats has increased dramatically, paralleling the six-fold increase in our appetite for the range of services provided by freshwater ecosystems (transportation, irrigation, recreation, municipal and industrial water supplies and energy production).

Physical alterations to aquatic habitats (riparian forests, wetlands, lakes and pools) can transform the biological and physical characteristics of the ecosystem such that natural processes and native species populations and communities become unstable or extinct. These alterations include:

- Changes in the natural cycle and volume of flow.
- Reductions or increases in sediment supply.
- Increasing water temperatures.
- Altering the composition and extent of riparian habitat along stream bank
- Fragmenting the continuity of rivers. (An estimated 95 percent of the historical spawning and rearing habitat for steelhead in the Central Valley is inaccessible due to impassable dams.)
- Reduction in streamflow due to diversions to meet urban needs and the production of crops as the population grows.

Throughout California, water quality impairments threaten ecosystem health and, in some cases, are major impediments to restoration. Urban activities, industry, mining, agriculture, and even recreation can play a part in water quality degradation. Even with water treatment, urban use contributes significant amounts of pollutants to surface and groundwater resources. Moreover, the industrial and energy-production processes supporting our population can give rise to water pollution problems, one example being atmospheric deposition of mercury, which in the methylated form is taken up in the ecosystem.

In rural areas the main pollution sources can come directly from land use practices both present and past. As an example, the Sierra Nevada Ecosystem Project notes the adverse impact that hydraulic mining, which ceased during the nineteenth century, is still having on numerous Central Valley rivers. In addition, logging and related road cuts are a major cause of high sediment loads to north coast streams. Transportation corridors for vehicular access result in significant erosion into watersheds throughout the coastal and inland areas. Grazing impacts, such as increased erosion, loss of streamside vegetation, loss of

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Chapter 5 provides a wide variety of management strategies to improve water supply reliability and resource management. A major challenge in today's economy with competition for limited resources is who will pay for needed management strategies.¶
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groundwater recharge ability in mountain meadows, and nutrient inputs, have contributed to the overall water quality degradation.

Aquatic non-native species invasions harm public health, compete with native fisheries, and impede or block water deliveries. Because invasive species interfere with natural processes and do not necessarily provide the full range of benefits associated with native species, management is essential. There are numerous gaps and duplications in California's regulatory framework. State, federal and local agencies have no cooperative method to identify and respond to existing and potential problems or coordinate rapid responses to infestations with established plans that have buy-in from all stakeholders.

A current challenge is how to protect and improve the environment given the continued need for water development and management, non-native species, water quality, and climatic variability. Water is often an important element of restoration programs, but water is also needed for urban and agricultural needs.

Constraints on inter-regional deliveries

Greater understanding of how some watersheds and groundwater systems interact could aid inter-regional water deliveries. It may appear on paper that a given amount of water is available to be delivered. However, without improved understanding of the systems via monitoring, the water may not be "real" (i.e., it is not a true increase in the amount of water available from a region). Such so-called paper water has been the subject of intense scrutiny recently. Some people view the transfer approval process as cumbersome and limiting for potential transfers. Water resources, conveyance capacity and environmental conditions in the Delta are major constraints for moving additional water from northern to southern California. Some counties have placed restrictions on exporting groundwater from their boundaries unless certain requirements are met. Some areas lack the conveyance facilities to allow interbasin water deliveries. One challenge is how to maintain ecological sustainability when water is moved. Another challenge is how to minimize impacts on other interests, such as the tax base and third-party impacts, when water is moved out of a community and into another.

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Groundwater overdraft

Overdraft is the condition of a groundwater basin in which the amount of water withdrawn by pumping over the long term exceeds the amount of water that recharges the basin. Overdraft is characterized by groundwater levels that decline over a period of years and never fully recover, even in wet years. Overdraft can lead to increased extraction costs, land subsidence, water quality degradation, and environmental impacts. Water budgets that have been projected in previous water plan updates have sometimes included a projected water shortage that has been called "overdraft." While the word 'overdraft' is a useful term to describe an event that has already occurred, it is incorrect to use that term to describe a projected water shortage that might or might not lead to overdraft. In many areas of the state, water managers expect that if there is a shortage of water, groundwater will be used to make up for that shortage. Based on that assumption, water managers have used the term 'overdraft' to describe that shortage. If a long-term negative change in storage of groundwater results in overdraft, unacceptable economic and environmental consequences may be the result.

Critical conditions of overdraft

In 1978, DWR was directed by the Legislature to develop a definition of critical overdraft and to identify those basins in a critical condition of overdraft (Water Code §12924). DWR held public workshops around the state to obtain public and water managers' input on what the definition should include, and which basins were critically overdrafted. Bulletin 118-80, Ground Water Basins in California, was published in 1980 with the results of that local input. The definition of critical overdraft is:

A basin is subject to critical conditions of overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts.

No time is specified in the definition. Definition of the time frame is the responsibility of the local water managers, as is the definition of significant adverse impacts, which would be related to the local agency's management objectives.

Eleven basins were identified as being in a critical condition of overdraft. They are:

Pájaro Basin	Cuyama Valley Basin
Ventura Central Basin	Eastern San Joaquin County Basin
Chowchilla Basin	Madera Basin
Kings Basin	Kaweah Basin
Tulare Lake Basin	Tule Basin
Kern County Basin	

The task was not identified by the Legislature, nor was the funding for the update of Bulletin 118-2003 sufficient to consult with local water managers and fully re-evaluate the conditions of the 11 critically overdrafted basins. Funding and duration were not sufficient to evaluate additional basins with respect to conditions of critical overdraft.

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In some cases the term overdraft is used to describe a short-term decline in groundwater in storage during a drought, or to describe a one-year decline of groundwater in storage. During a drought the aquifer is being used as a reservoir and water is being withdrawn with the expectation that the aquifer will be recharged during a wet season to follow. A one-year decrease of the amount of groundwater in storage is an annual change in storage and does not constitute overdraft.

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People without clean and safe drinking water

Californians lacking access to clean and safe drinking water are vulnerable to a higher incidence of disease than the general population. Untreated water can contain bacterial, parasitic, and viral contaminates. People at risk most often get their water from untreated surface water, such as rivers, lakes, or springs. They may also have shallow unsealed wells, or use irrigation ditch water. Surface water and shallow wells can become contaminated from rain runoff or flooding. A further concern is sewage disposal. Many rural communities have problems associated with failing septic drainfields, and sewage surfacing in yards. This lack of wastewater infrastructure may cause cross-contamination with potable water.

Census figures from 1990 indicate that 31,932 housing units obtained their water from shallow wells and another 49,319 housing units obtained their water from some source other than dug wells, drilled wells, or public or private water systems. The same census counted 67,865 housing units (less than 1 percent of the state's population) that disposed of their sewage by means other than a public sewer, septic tank, or cesspool.

Insufficient state and federal funding for Bay-Delta Program Stage 1 implementation

State funding to date for CALFED has been primarily through the Water Bonds (204, 13, 40, and 50). Federal funding for Bay-Delta Program post-ROD implementation has been significantly less than the state and user/local funding. The largest water user funding has been for conservation programs and water recycling projects. With today's economy, state and federal assistance and funding will be more limited than in the recent past and beneficiaries should expect to pay a greater share for programs and projects that serve them.

Regional challenges

The regional challenges are summarized in Chapter 4 and are presented in more detail in Volume 2.

2.6. Today's responses to challenges.

Today's water management includes a broader range of practices than historically thought to be available. Where historical resources needs were often viewed in terms of tradeoffs between resources , today's comprehensive planning considers all needs. The role of local and regional water supplies as part of the mix of resources to be developed to meet the larger statewide supply objectives is a key part of the planning. The adjacent box highlights significant recent responses to the challenges listed in the previous section.

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While treaties and other documents establishing reservations described the purposes of the reservations, the documents did not provide detailed descriptions of the water rights necessary to fulfill the purposes of the reservations. By the time (often decades after the reservations were established) many reservations found a need to affirm their water rights, water was already allocated to other uses through the state water rights permitting process, and substantial conflicts have since emerged. In its 1963 decision Arizona v. California, the U.S. Supreme Court reaffirmed the Winters Doctrine and established a process for quantifying reserved water rights. This process was based on "practicably irrigable acreage,", an estimate of the potential ultimate needs for agriculture on the reservation. Quantifying water needs in terms of agricultural potential does not accurately show the many other needs for water. Even urban water quantity and quality assessments that look at the adequacy of the domestic water supply and sanitation do not provide a complete picture of tribal water needs. A large part of the tribal water needs are for instream flows and other water bodies that support environmental and cultural needs for fishing, hunting, and trapping. Given the large number (over 100) of ... [1]

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The California Legislature has produced several regulations to improve water management and integrated planning at the local level. Recent legislation has also encouraged improvements in recycling, desalination and groundwater potential. The box on the following page shows legislation and litigation that significantly influenced water management since publication of Bulletin 160-98.

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Significant Legislation Since Bulletin 160-98

- **SB 1075** (Johnston, Chapter 583, Statutes of 1998) – Delta Protection Commission
- **SB 1765** (Peace, Chapter 813, Statutes of 1998) – Colorado River Management Program
- **SB 496** (Sher, Chapter 1016, Statutes of 1999) – Wild and Scenic Rivers: South Yuba River
- **SB 970** (Costa, Chapter 938, Statutes of 1999) – Water Rights
- **SB 1062** (Poochigian, Chapter 210, Statues of 1999) - The California Water Plan
- **AB 1593** (Villaragiosa, Chapter 1017, Statutes of 1999) – Wild and Scenic Rivers: South Yuba River
- **AB 303** (Thomson, Chapter 708, Statutes of 2000) – Local Groundwater Management Assistance
- **AB 1147** (Honda, Chapter 1071, Statutes of 2000) – Flood Control
- **SB 1341** (Burton, Chapter 720, Statues of 2000) - State Water Plan
- **SB 221** (Keuhl, Chapter 642, Statues of 2001) - Certification of Sufficient Water Supply
- **AB 331** (Goldberg, Chapter 590, Statues of 2001) - 2002 Recycled Water Task Force
- **AB 599** (Liu, Chapter 522, Statues of 2001)—The Groundwater Quality Monitoring Act of 2001
- **SB 610** (Costa, Chapter 643, Statues of 2001) - Water Supply Planning
- **SB 672** (Machado, Chapter 320, Statues of 2001) - Regional Planning & Water Plan Update
- **SB 1191** (Speier, Chapter 745, Statutes of 2001) –State and Local Reporting Requirements
- **SB 482** (Kuehl, Chapter 617, Statues of 2002)
- **AB 857** (Wiggins, Chapter 1016, Statues of 2002) - State Strategic Planning
- **SB 1518** (Torlakson, Chapter 261, Statutes of 2002) – Recycled Water
- **SB 1653** (Costa, Chapter 812, Statutes of 2002) – California Bay-Delta Act.
- **SB 1672** (Costa, Chapter 767, Statutes of 2002) - Integrated Regional Water Management Planning
- **SB 1938** (Machado, Chapter 603, Statues of 2002) - Groundwater Management Plans
- **AB 2534** (Pavley, Chapter 727, Statutes of 2002) – Watershed, Clean Beaches, and Water Quality
- **AB 2587** (Matthews, Chapter 615, Statues of 2002) – Food: Water Usage Forecasts
- **AB 2717** (Hertzberg, Chapter 957, Statues of 2002) – State Desalination Task Force
- **AB 314** (Kehoe, Chapter 206, Statutes of 2003) – Desalination

Significant Litigation Since Bulletin 160-98

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Inadequate assessment of tribal water needs

While treaties and other documents establishing reservations described the purposes of the reservations, the documents did not provide detailed descriptions of the water rights necessary to fulfill the purposes of the reservations. By the time (often decades after the reservations were established) many reservations found a need to affirm their water rights, water was already allocated to other uses through the state water rights permitting process, and substantial conflicts have since emerged. In its 1963 decision Arizona v. California, the U.S. Supreme Court reaffirmed the Winters Doctrine and established a process for quantifying reserved water rights. This process was based on "practicably irrigable acreage,", an estimate of the potential ultimate needs for agriculture on the reservation. Quantifying water needs in terms of agricultural potential does not accurately show the many other needs for water. Even urban water quantity and quality assessments that look at the adequacy of the domestic water supply and sanitation do not provide a complete picture of tribal water needs. A large part of the tribal water needs are for instream flows and other water bodies that support environmental and cultural needs for fishing, hunting, and trapping. Given the large number (over 100) of federally recognized and other non-recognized tribal groups with differing water needs, it is difficult to adequately compile and report these needs in one document. None of the prior California Water Plan Updates have provided an assessment of tribal water needs.

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Collectively, at the end of 2003, the third year of implementation, funding has been over $220 million less than planned.

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Competing and conflicting jurisdictional roles and responsibilities

Competing and conflicting roles and responsibilities, given the numerous jurisdictional entities and decentralization of water management, make it difficult to integrate regional water management. Differing roles of the various state and federal governments during planning can lead to some processes proceeding too far before the safeguards of NEPA and CEQA are applied.

Water Pricing

One of the biggest challenges in water pricing is how to encourage reasonable and beneficial use of water. That entails controversial task of defining the "real cost" of water. Many people object to how the government subsidizes the price of water, thinking that it encourages wasteful practices. If changes to pricing structures are proposed, what are the desired outcomes of the changes? Should the water be priced to encourage a given behavior from th